

REMARKS

Applicants hereby request non-entry of the previously filed unentered amendments and request that the amendments above be entered.

After entry of this amendment, claims 1-11 and 35-39 are pending. New claims 35-39 have been added and finds support *inter alia* in the original claims. New claims 35 and 36 finds further support in the specification, for example, at page 26, lines 17-18. New claim 36 finds further support in the specification, for example, at page 62, lines 25-29, page 69, lines 2-20, and page 75, lines 8-27. New claims 37-39 find further support in the specification, for example, at page 69, lines 2-20, and page 75, lines 8-27. Claims 12-34 have been cancelled without prejudice or disclaimer. Claims 1 and 4 have been amended without prejudice or disclaimer and find support *inter alia* in the original claims. Claim 1 finds further support in the specification, for example, at page 26, lines 17-18, and page 62, lines 25-29. No new matter has been added.

Applicants enclose herewith a Request for Continued Examination requesting entry of the above claim amendment and consideration of the present remarks. The above claim amendment and following remarks address the rejections in the Final Office Action dated May 20, 2010 and also the comments in the Advisory Action mailed July 27, 2010.

Claim Objections

Claims 2-4 are objected to for reciting non-elected sequences. As indicated by the Examiner in the Office Action at page 2, Applicants respectfully request reconsideration and rejoinder of the non-elected sequences upon allowance of the generic claim (i.e. claim 1). 37 CFR § 1.141; MPEP § 809.02(a).

Double Patenting

Claim 3 remains provisionally rejected for obviousness-type double patenting over claims 1-9 of co-pending Application No. 10/590,958. Because this is a provisional double patenting rejection, Applicants will consider filing an appropriate terminal disclaimer upon an indication that the claims are allowable.

Claim Rejection – 35 U.S.C. § 102

Claims 1 and 5-11 remain rejected under 35 U.S.C. § 102(b) as being anticipated by Drexler *et al.* (hereinafter “Drexler”). Applicants respectfully disagree and traverse the rejection.

However, to expedite prosecution, claim 1 has been amended without prejudice or disclaimer to recite the polypeptide with $\Delta 5$ -elongase activity with more specificity. It is submitted that the claims as amended overcome the present rejection for the reasons already of record and for the following additional reasons.

As discussed in the Response dated February 25, 2010, Drexler does not teach production of very long-chain polyunsaturated fatty acids ("VLCPUFA") by introducing into one single plant nucleotide sequences encoding a $\Delta 6$ -desaturase, a $\Delta 6$ -elongase, a $\Delta 5$ -desaturase, a $\Delta 5$ -elongase, and a $\Delta 4$ -desaturase. As also discussed therein, Drexler does not teach a $\Delta 5$ -elongase as disclosed in the present application. The Examiner, however, contends that the elongase genes disclosed in the references cited in Drexler, such as KCS-cDNA isolated from *L. douglasii*, are considered to be $\Delta 5$ -elongase coding sequences because the specification allegedly does not define the term " $\Delta 5$ -elongase" and this term was not used in available online enzyme nomenclature databases. Office Action at pages 5-6. Applicants strongly disagree.

It is noted initially that the term " $\Delta 5$ -elongase" is well defined throughout the specification. For example, the activity of a $\Delta 5$ -elongase suitable for practicing the present application is provided and described in detail in the specification at page 26, lines 12-41. As described therein, the $\Delta 5$ -elongase according to the present application preferably converts unsaturated C_{20} -fatty acids. The specification further describes that the $\Delta 5$ -elongase according to the present application can also convert C_{16} - and C_{18} -fatty acids with one double bond and advantageously polyunsaturated C_{18} -fatty acids with one $\Delta 6$ double bond and polyunsaturated C_{20} -fatty acids with one $\Delta 5$ double bond. See Specification at page 62, lines 25-30. Thus, contrary to the Examiner's assertion, " $\Delta 5$ -elongase" is well defined throughout the specification as being capable of converting unsaturated fatty acids.

Applicants further note that, as described in Drexler at pages 795-796, different types of elongases exist. For example, the two elongations of $\Delta 9$ -18:1 to $\Delta 13$ -22:1 as catalyzed by the KCS enzyme and its allies involve exclusively intermediates of the acyl-CoA pool. The elongations in DHA biosynthesis, on the other hand, presumably depend on several rounds of enzyme-catalyzed shuttling of the acyl group between lipid-linked oxygen ester (for desaturation) and CoA-bound thioester forms (for elongation). Recent investigations further show that the PUFA-elongating enzymes are encoded by a gene family completely different

from the KCS family. See Drexler at page 795, right Col., citing to Zank *et al.* (Plant J., 2002, 31: 255-268).

The elongase genes disclosed in the references cited in Drexler, such as the KCS-cDNA isolated from *L. douglasii* (citing Cahoon *et al.*, Plant Physiology, 2000, 124: 243-251; hereinafter “Cahoon”; copy attached), although could be considered as a $\Delta 5$ -elongase, it actually encodes a FAE-type elongase which elongates primarily **saturated** fatty acids (e.g., 16:0 or 18:0) but not unsaturated fatty acids (e.g., 16:1 or 18:1). See Cahoon at page 247, paragraph bridges left and right columns. Contrary to those FAE-type elongases disclosed in Cahoon and Drexler, the elongases according to the present application, the ELO-type $\Delta 5$ -elongases, elongate **unsaturated** fatty acids with at least one double bond as discussed above.

Moreover, Applicants note that, as stated in Drexler, the only enzyme that has not yet been identified by explicit functional expression studies of the isolated cDNA is a $\Delta 5$ -specific elongases limited to the elongation of C₂₀- to C₂₂-fatty acids. See Drexler at page 796, left Col., 1st paragraph. Thus, it is clear that a $\Delta 5$ -elongase limited to the elongation of C₂₀- to C₂₂-fatty acids was not known, so as an ELO-type $\Delta 5$ -elongase limited to the elongation of unsaturated C₂₀-fatty acids, which was disclosed for the first time in the present application.

Without acquiescing to the merits of the Examiner’s arguments and to further clarify and differentiate the claimed subject matter from the cited reference, claim 1 has been amended to specify that the recited $\Delta 5$ -elongase elongates **unsaturated** C₂₀-fatty acids. As discussed above, Drexler, or the references cited therein, does not teach a $\Delta 5$ -elongase elongates unsaturated C₂₀-fatty acids. Because Drexler does not teach each and every limitation as set forth in the present claims as discussed above, either expressly or inherently, it is respectfully submitted that Drexler does not anticipate the present claims.

For at least the above reasons and for the reasons already of record, and in further view of the present amendments, reconsideration and withdrawal of the rejection is respectfully requested.

Claim Rejections – 35 U.S.C. § 103

Claims 1, 2 and 5-11 are rejected under 35 U.S.C. § 103(a) as being obvious over Drexler in view of Geneseq Accession No. ABV74260. Claim 4 is rejected under 35 U.S.C. § 103(a) as

being obvious over Drexler in view of Geneseq Accession No. ABV74262. Claim 3 is rejected under 35 U.S.C. § 103(a) as being obvious over Drexler in view of EST Accession No. BE777235. Applicants respectfully disagree and traverse all above rejections for the reasons already of record and for the following additional reasons.

The discussion above concerning Drexler is equally applicable here and thus, is incorporated by reference in its entirety. As discussed above, Drexler does not teach production of VLCPUFA by introducing into one single plant nucleotide sequences encoding a $\Delta 6$ -desaturase, a $\Delta 6$ -elongase, a $\Delta 5$ -desaturase, a $\Delta 5$ -elongase, and a $\Delta 4$ -desaturase. Specifically, as discussed above, Drexler does not teach a $\Delta 5$ -elongase capable of elongating C₂₀- to C₂₂-fatty acids or one capable of elongating unsaturated C₂₀-fatty acids.

The combination of Drexler with ABV74260 does not remedy this deficiency so to render claims 1, 2 and 5-11 obvious. As discussed in the Response dated February 25, 2010 and noted by the Examiner, ABV74260 discloses a $\Delta 6$ -desaturase coding sequence from *Physcomitrella patens*. Thus, even if combined, the combined teaching of Drexler and ABV74260 still does not teach or suggest a $\Delta 5$ -elongase that elongates unsaturated C₂₀-fatty acids as required by the present claims.

Similarly, the combination of Drexler with ABV74262 does not remedy this deficiency so to render claim 4 obvious. As noted by the Examiner, ABV74262 discloses a desaturase sequence that is allegedly 62.9% identical to SEQ ID NO: 110, which is identified in the present application as having $\Delta 12$ -desaturase activity. Thus, even if combined, the combined teaching of Drexler and ABV74262 still does not teach or suggest a $\Delta 5$ -elongase that elongates unsaturated C₂₀-fatty acids as required by the present claims.

Likewise, the combination of Drexler with BE777235 does not remedy this deficiency so to render claim 3 obvious. As noted by the Examiner, BE777235 discloses a sequence that is allegedly 60% identical to SEQ ID NO: 88, which is identified in the present application as having $\omega 3$ -desaturase activity. Furthermore, Applicants note that the sequence disclosed in BE777235 is only partial sequence, which would likely not confer the desaturase activity. Thus, even if combined, the combined teaching of Drexler and BE777235 still does not teach or suggest a $\Delta 5$ -elongase that elongates unsaturated C₂₀-fatty acids as required by the claims as amended.

Because Drexler and ABV74260, alone or in combination, do not teach or suggest all the limitations of the claimed process, a *prima facie* case of obviousness has not been established as to claims 1, 2 and 5-11. Similarly, because Drexler and ABV74262, alone or in combination, do not teach or suggest all the limitations of the claimed process, a *prima facie* case of obviousness has not been established as to claim 4. Likewise, because Drexler and BE777235, alone or in combination, do not teach or suggest all the limitations of the claimed process, a *prima facie* case of obviousness has not been established as to claim 3.

For at least the above reasons and for the reasons already of record, and further in view of the present amendments, reconsideration and withdrawal of the rejections is respectfully requested.

Potential Issues Related to 35 U.S.C. § 112

In the Advisory Action dated July 27, 2010, the Examiner indicates that the unentered claim amendments raise potential new issues under 35 U.S.C. § 112, first paragraph, written description and enablement, as well as second paragraph. In considering the present amendments, the Examiner's attention is respectfully directed to the disclosure provided in the present specification, for example, at page 26, lines 12-41, and page 62, lines 25-29, where the specificity of the claimed $\Delta 5$ -elongase is discussed. The Examiner's attention is further directed to the specification at pages 13-15, for instance, where numerous examples of the claimed $\Delta 5$ -elongases are provided. At least two of those $\Delta 5$ -elongases are further demonstrated to possess the recited specificity in elongating unsaturated C_{20} -fatty acids. See e.g., Figure 28 (A) *Ostreococcus tauri* $\Delta 5$ -elongase) and (C) (*Thalassiosira pseudonana* $\Delta 5$ -elongase).

Moreover, as discussed above, the $\Delta 5$ -elongases suitable for practicing the claimed process convert preferably unsaturated C_{20} -fatty acids, but can also convert unsaturated C_{16} - and C_{18} -fatty acids. Thus, the recitation " $\Delta 5$ -elongase activity that elongates unsaturated C_{20} -fatty acids" as recited in claim 1 encompasses not only $\Delta 5$ -elongases that covert specifically unsaturated C_{20} -fatty acids, but also $\Delta 5$ -elongases that covert unsaturated C_{20} -fatty acids and unsaturated C_{16} - and/or C_{18} -fatty acids. Conversely, the recitation " $\Delta 5$ -elongase activity elongates only unsaturated C_{20} -fatty acids" (emphasis added) as recited in new claim 35 encompasses only $\Delta 5$ -elongases that specifically covert unsaturated C_{20} -fatty acids but not

unsaturated C₁₆- and/or C₁₈-fatty acids. Accordingly, claim 1 and new claim 35 differ in scope related to the claimed $\Delta 5$ -elongase.

CONCLUSION

For at least the above reasons, Applicants respectfully request withdrawal of the rejections and allowance of the claims. If any outstanding issues remain, the Examiner is invited to telephone the undersigned at the number given below.

Applicants reserve all rights to pursue the non-elected claims and subject matter in one or more divisional applications.

Accompanying this response is a Request for Continued Examination with the required fee. No further fee is believed due. However, if any additional fee is due, the Director is hereby authorized to charge our Deposit Account No. 03-2775, under Order No. 12810-00193-US from which the undersigned is authorized to draw.

Respectfully submitted,

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Attachment: Cahoon *et al.*, Plant Physiology, 2000, 124: 243-251